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# New York State Flower Growers

INCORPORATED

BULLETIN 7 FEBRUARY 1946

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## SUPERIOR BULB CO. LIMITED

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NEW YORK STATE FLOWER GROWERS

INCORPORATED

## Don't Let Those Chrysanthemums Bud!

Remember how the stock plants and rooted cuttings of chrysanthemums budded last spring? It might happen again. You can prevent it happening by lighting the plants for 30 minutes each night from 12 to 12:30 or a similar period. Forty watt bulbs with reflectors, hung five feet on centers will do the job.

Chrysanthemums bud when the days are less than 14 hours in length and the night temperature is above 60 degrees. If the night temperature goes above 60 before April 20 and you are not using lights, expect some budding. Continue the light treatment until April 20 and start it not later than March 15, better March 1. You will also get more cuttings.

Don't be in a hurry to propagate your mums. Cuttings taken April 15 will be good for cloth work to flower in early September. Normal season bloom will be best from cuttings taken June 1 to 15.

Professor Kenneth Post
Department of Floriculture and Ornamental Horticulture

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## In This Issue



## Fermate Injury to Rooted Cuttings

In the article entitled "Avoiding Disease Carry-Over on Carnation Cuttings," which appeared in Bulletin 4 of the New York State Flower Growers, Inc., it was suggested as step 9 in the disease-control program that the rooted cuttings be dipped, roots and all, in Fermate solution before they were potted or flatted up. We had used this treatment many times on the varieties available with no evidence of injury. Within the past few weeks however, two or three growers have reported severe root injury to many varieties when this treatment was employed. The reaction of different varieties varied greatly, ranging from a slight, temporary injury to death of the plants. Other growers have used the treatment on many varieties with no apparent injury. Just why injury has occurred only on some variety and under some conditions we do not know. Because of the risk involved, this practice of dipping the rooted cuttings should be discontinued until the problem is solved.

In contrast to the contradictory results obtained with the dipped rooted cuttings, treatment of the unrooted cuttings before sticking them into the sand (step 6), when used exactly as recommended has been consistently safe and effective. Growers who experienced root injury from dipped rooted cuttings are enthusiastic about the results obtained from dipping unrooted cuttings. The practice of dipping the unrooted cuttings before you put them into sand should therefore be continued.

Similar inconsistencies have developed with geranium-cutting treatments. Although tens of thousands of unrooted cuttings have been given the complete dip treatment with no apparent injury, some injury has been reported from dipping rooted cuttings. Here again we suggest that the complete dip of the rooted cuttings be used only in a trial way until we can determine the causes of the reported injury.

Professor A. W. Dimock
Department of Plant Pathology

# Welcome New Members

## Active

Erie
John Schnobrick, Pine Ridge Floral Shop, 440 Pine Ridge Rd., Buffalo 11

Nassau
Allen H. Berg, 344 Hempstead Ave., W. Hempstead
Hans Jacobsen, 749 Middleneck Rd., Great Neck
Philip Mark, Luddington Rd., East Meadow
Arthur Perlow, M. Perlow Inc., Silver Lane, Oceanside
Herman Veit, Hugo Bergman, Inc., 1133 Fulton St., Hewlett

Niagara
Anthony Grella, Anthony Grella Nursery, Mohawk St., Lewiston

Rookland
Herbert A. Burns, Shite St., Spring Valley
Robert A., Giblin, New City
Herman Mamitsoh, Jr., Tappan Gardens Inc., Tappan
Emil Maus, 277 N. Highland Ave., Nyack 8
Martin Scheu, Conger Ave., Congers

Suffolk
George H. Beckman, Box #231, E. Northport

Westchester
Frederick H. Stuber, G. H. Stuber, Florist, 321 Bronx River Rd., Yonkers

## Associate

Connecticut
Alex Agnew, Watertown
E. F. Curtiss, Plantsville
S. J. Greco, Pease Ave., Middletown
John P. Hansen, 363 Reef Rd., Fairfield
Loren Sniffen, Fillow Flower Co., Clinton Ave., Westport
Dallas W. Thomas, W. D. Thomas & Son, Circular Ave., Hamden 14
John J. Walsh, Wm. G. Racker Ass'n. Old Colony Rd., Meriden

Delaware
James A. Kirk, Route #3, Newark
W. D. Martine, Wm. D. Martine & Sons Co., Wilmington 2

Indiana
Henry Phelps, Remington
Walter L. Schrock, Schrock's Flowers, E. 3rd St., Ligonier

Maryland
Rutland Beard, Catonsville 28
E. R. Fischer & Sons, R.D.#16, Box #42, Baltimore 21
Carl G. Francis, 8739 Satyr Hill Rd., Baltimore 14
Goebels Florist, Kensington
Niels Hansen, 9400 Jones Mill Rd., Chevy Chase
Wm. G. Lehr, 5718 Governor Richie Highway, Baltimore 25
Towson Nurseries, Towson 4
Philip B. Welsh & Sons, Reisterstown

Massachusetts
Albert E. Neddy, Roman J. Irwin, 9 Woodchester Drive, Milton

New Jersey
D. J. Brimecombe, Jr., Masonville
Harry A. Croyder, Roozen Bros., 6 Valley View Ave., Summitt
Julius Roehrs Company, 575 Paterson Ave., Rutherford
Anthony C. Roozen, Roozen Bros., 6 Valley View Ave., Summitt

New York
Carl C. Beck, 613 Broadway, Albany
Dr. Walter R. Bedell, 49 Market St., Poughkeepsie
Tobbio Martino, McKinley Vocational School, 1500 Elmwood Ave., Buffalo 7
George L. Stroh, Atkinsons Greenhouses, 69 Charlotte St., Canandaigua
G. E. Wurz, Bonide Chemical Co., 382 N. Genesee St., Utica

Ohio
L. M. Saeltzer, Saeltzer Floral Co., 25039 Centre Ridge Rd., Rocky River

Pennsylvania
Harry F. Beyler, Beyler Greenhouses, 118 W. Walnut St., Shillington
Janet Craig Dalsimer, Robert Craig Co., Norwood
Peter DeSandis, Moscow
W. B. Girvin, Leola
Anthony Grasso, East Connellsville Ghse., Box 489, Connellsville
Otto Heck, Heck Brothers, Wyomissing
Russell E. Whitlock, 660 Slocum Ave., W. Pittston
L. H. Wilson, Hillside Cemetary, Roslyn

Rhode Island
C. Emil Anderson, Oak Lawn Ghses., Hope Rd., Oak Lawn
Alfred T. Frye, Roger Williams Park, 489 Park Ave., Providence

Tennessee
Lester Eok, Joy's Greenhouses, Inc., 1505 Lischey Ave., Nashville 7

England
J. & J. Tod, Ltd., Stocks Lane Gardens, Peover, Cheshire

Hawaii
O. H. Lyman, Experiment Station, Hawaii Sugar Planter's Assn., P.O. Box 836, Hilo, Hawaii T.H.

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# Automatic Watering

Dr. Kenneth Post
Department of Floriculture and Ornamental Horticulture
Cornell University, Ithaca, N.Y.

## PRINCIPLES BACK OF AUTOMATIC WATERING

When a bench of soil is thoroughly watered from the surface and allowed to drain, the water remaining is held by capillarity. It surrounds the soil particles and the roots, and is in many of the small pores between the soil particles. As the soil becomes drier the films of water are held tighter around the soil particles. The tensiometer reading is greater indicating an increase in the capillary tension.

In a bench of soil that has dried somewhat, these films of water are larger at the bottom than at the top of the bench because of the action of gravity. The capillary tension is greater near the top of the soil than near the bottom.

At first these films of water are all connected. As water is removed from one area, more water moves by capillarity to replace the loss. By capillary movement the films of water tend to remain equal in size throughout the soil volume. If the soil becomes quite dry, the capillary films are broken and water no longer moves to the dry spots.

The capillary movement of water is rapid at low tensiometer readings. All automatic watering should, therefore, be at low tension to take advantage of this fact. Capillary movement is most rapid in fine sand and poorest in clay and silty soils; by maintaining low capillary tension it can be maintained in any soil type.

See also Cornell Bulletin 793.

## HOW AUTOMATIC WATERING WORKS

Methods of automatic watering employ these principles of capillary movement. The lower layer of soil is wet and water moves toward the top of the soil by capillarity. The soil is never saturated with water, and oxygen can diffuse into it readily from the surface.

A water-tight bed level lengthwise is necessary. It is best to put tile or some other conductor in the bottom and to place a thin layer of gravel, from 1 to 2 inches, in the bench to provide easy movement of the water under the soil.

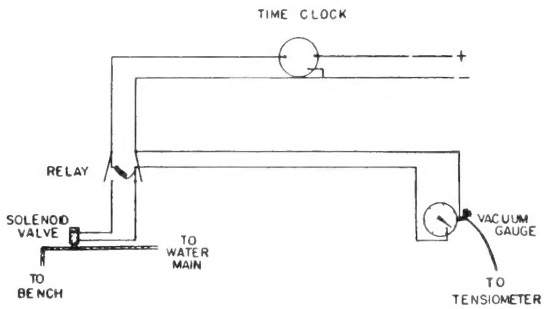
When the soil reaches a capillary tension of 1 inch, only enough water is injected in the bottom of the bench to reduce the capillary tension to 0. Usually from 3 to 5 pints to each square foot of bench area are enough. It will all be absorbed by the soil in about two hours. The soil acts as a wick pulling the water upward and satisfying the capillary tension. Water moves laterally as well as upward and moistens soil at the side of the bench.

## APPLICATIONS OF AUTOMATIC WATERING

Several variations in the application of automatic watering to cut-flower crops have evolved. (1) The benches may be piped and valved individually. When the tensiometer reads 1 inch, the valve is opened and the water flows for a period of time sufficient to inject the correct amount of water (about two quarts to the square foot). (2) An electric valve wired to a tensiometer and the current run through a time switch operates the valve automatically (see wiring diagram). (3) a constant water level may be maintained in the bench by the use of a poultry watering float valve (see diagram). (4) As many benches may be connected to one unit as are of the same elevation, and any of these systems of getting water to them can be used.

The float-valve arrangement giving a constant water level requires the least equipment and is liked by many growers. This arrangement has been tried the shortest time of any method. First installations have been in operation for about one year. It looks good and should give satisfaction if the water table is kept just in contact with the soil. If the water is too high in the soil, anaerobic bacteria will become active, marsh gas will arise, and plants will be injured.

This system is at a disadvantage if the bench leaks. If bench leaks cannot be plugged, the injection system may be used to provide enough water at each injection to take care of the leak and to moisten the soil.




WIRING DIAGRAM FOR COMPLETE AUTOMATIC WATERING OF BENCH CROPS

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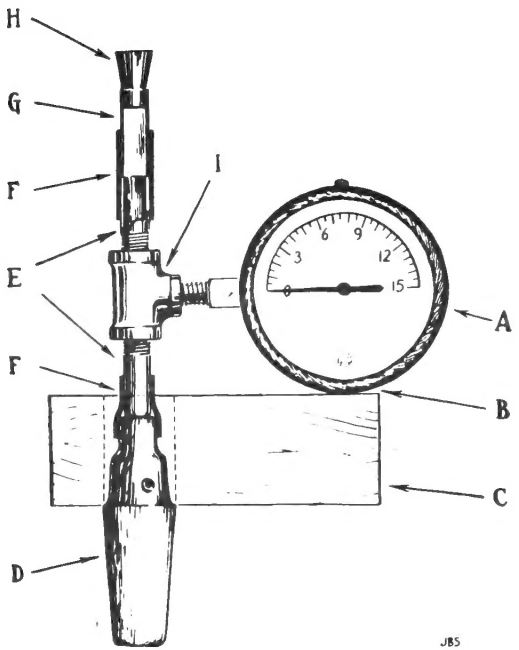
## THE SOIL TENSIOMETER

The soil tensiometer was adapted as a guide to know when to water. It does not measure the moisture content of the soil but does measure the tension with which the water

The Soil Tensiometer




A - Vacuum Gauge 15 inches mercury vacuum
B - Screw removed to allow water escape
C - Block of wood 2"x2"x5" with 1 1/8" hole
D - Tensiometer cup No. K94S
E - Brass nipple 1/4" ID x 1 1/2"
F - Koroseal 5/16 ID - 1/8" wall
G - Air trap glass tube 10MM ID
H - Rubber stopper No. 00

is held around the soil particles. A peat soil may hold 200 per cent water and a sandy soil only 25 per cent water, yet both may be at the same capillary tension. The plant would remove the water from both soils with the same ease because the water is held by the soil at the same tension.

If it were found desirable to water a given soil type at a tensiometer reading of 1 inch, any other soil of similar depth and growing the same crop should be watered at the same tension. We soon found that some soil mixtures and some soil types required watering when they looked wet. Soil that had been mulched with manure looked wet when it had a high tensiometer reading that showed it was in need of water. In general, clay, silty, and peaty soils look wet when the tensiometer shows they need water; sandy soils look dry before the tensiometer registers.

It is doubtful whether any person can tell when soil should be watered by the feel unless he has had considerable experience with it. When we were comparing soil mixtures it would have been impossible to keep them at the same capillary tension without tensiometers. Our work shows clearly that differences in growth of roses in various soil mixtures are likely due to the amount of water available or to differences in nutrition. If you are not sure you are watering your soil correctly, set a tensiometer and follow it. Follow the diagram in putting together your tensiometer. Have the rubber connections as short as possible and use plenty of compound in the joints.

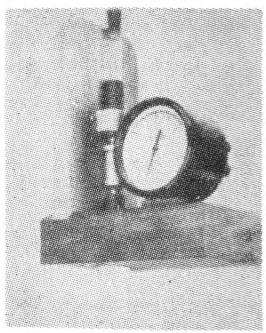
When setting the tensiometer make a hole, the size and shape of the cup, with a soil-sampling tube or trowel and fit the cup into it firmly. Don't jam the cup into the soil.

Set the tensiometer in the bench where the soil dries at an average rate for the bench. Usually between the first and second rows of plants from the south side of the bench and at least 5 feet from the end is near average. Don't move the tensiometer frequently. A correct reading cannot be had in less than two hours after the cup is set.

One tensiometer is enough for each bench operating individually if the bench is level lengthwise of the house. If several beds are the same level and connected to operate from one valve, one tensiometer is enough for the section. This is assuming you are injecting water to keep the soil at a low tension (not more than 3 inches). The diagram shows how to wire a tensiometer to an automatic valve for automatic injection.

Tensiometers are not used when the constant water level is maintained.

Soil tensiometers ready to set are now obtainable through your florist-supply dealers. Robert T. Geary, Plant Products Co., Blue Point, New York, and Lord and Burnham Co., Irvington, New York, are making and distributing them direct.



The soil tensiometer for operating an automatic valve. Produced by Lord and Burnham Co.

## IT WORKS ON ALL CROPS

We have used automatic watering on roses, carnations, sweet peas, chrysanthemums, snapdragons, stocks, and other cut-flower crops. We have obtained little differences in production as compared with plants surface watered at the same capillary tension. The saving of labor, the uniform thorough watering with no packing of soil, the reduction of the amount of fertilizer used, and no spread of disease by splashing water are its great advantages. Most growers will probably increase production because they can maintain more uniform and greater water supply.

Our production of all crops has been high where we have maintained a uniform high supply of moisture. We averaged from 34.5 to 36.9 flowers on Peters Briarcliff roses in eleven months in 1943-44; for twelve months in 1944-45 we cut from 42 to 45 flowers per plant with an average stem length of 20 + inches. Virginia carnations in the second year of production cut 25 flowers per square foot of surface watered and 32 flowers automatically watered. Plants that do not flower continuously, as stocks and chrysanthemums, gave no difference in production.

## IT WORKS ON ALL SOILS

Any soil type can be used with automatic watering. It is especially desirable for soils which tend to bake or develop a structure impervious to water. Soils which tend to loose capillarity and dry at the surface should be saturated with water occasionally or watered from the surface once or twice each month.

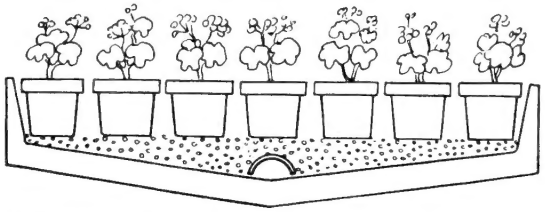
It is probably not necessary to condition the soil with peat or manure as for surface watering. Soils with high organic content loose their capillarity more readily than those lower in organic content.

Heat pasteurized soils tend to loose capillarity more readily than unheated soils. This is corrected by flooding the soil from below occasionally or by an occasional surface watering. This difficulty is usually corrected after three or four such floodings.

No matter what the problem arising in your soil, you will observe it and correct it before any damage is done. In all of our experimenting to learn about the system we have never lost a crop and have constantly increased production and quality.

## USE IT FOR POTTED PLANTS

The greatest labor saver of all is automatic watering of potted plants. We use a watertight bench and inject water in it to half submerge the pots at the time of watering. The water stands until the soil is wet then the surplus is drained from the bench. We have used it on all plants grown in pots and have been able to do as good a job of growing as by surface watering. The plants dry uniformly and they are all thoroughly watered each time.



A V-Bottom Bench leveled with gravel for automatically watering potted plants —

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## THE AUTOMATIC PROPAGATING BENCH

You can work it out for your own conditions and root nearly 100 per cent. All you need is a watertight bench and good propagating sand which is not too fine. We find our sand for cement work is excellent. It contains about 60 per cent sand which passes a 1/16 inch mesh screen. The remainder passes a 1/8 inch mesh screen but not the 1/16 inch.

If the sand is too fine roots form near the top of the sand while if it is too coarse you will loose many cuttings by drying. One trial with your sand and you can make the necessary adjustment before the cuttings are lost.

If the sand is too fine, lower the water table; while if it is too coarse, raise the water table. We have found sand which passes a 1/8 inch screen works fine for poinsettias with a water table 1 to 2 inches below the base of the cutting. Roses and carnations root best if the base of the cutting is in water in this coarse sand. In our regular cement sand all things root well with the water table about 2 inches below the base of the cutting.

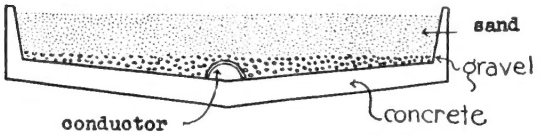
You probably cannot compare that method of rooting with surface watering because you cannot maintain the same water content of the sand and other conditions cannot be the same. You can easily make it work or make it fail depending on your desire.

## HOW THE PROPAGATION BENCH WORKS

The sand is not packed. The water table is raised to flood the sand and the cuttings are stuck. No trench is cut and the sand is not packed. The water table is drained down to 1 to 2 inches below the base of the cutting and set with a float valve to hold there. Cuttings are taken from the plant and no leaves are removed. Only one thickness of cheese cloth shade is used over the cuttings.

When you remove them from the sand raise the water table to saturate the sand and pull the cuttings. It has worked very well for us

on Saintpaulias, begonias, geraniums, roses, carnations, hydrangeas, chrysanthemums and other cuttings.




Bench for automatic propagation. Pea gravel is used on the bottom and coarse propagating sand on this. The water level is adjusted depending on fineness of sand. Usually one to two inches below the base of cuttings.

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## THE BENCHES

The benches must be level lengthwise of the house and nearly watertight. If you build all benches in a house at one time, make them level crosswise of the house to permit all to be connected and operated from one water valve. Have a drain, plugged or valved on each bench.

Shallow "V" benches work well. The drop should be no more than 2 inches from the sides to the center of the bench. Flat-bottom benches are satisfactory also. Six-inch sides inside the bench are high enough. Eight-inch sides are also satisfactory.

For benches more than 150 feet long, probably it is best to have the point of injection for water near the middle of the bench so the water may move both ways from this point.

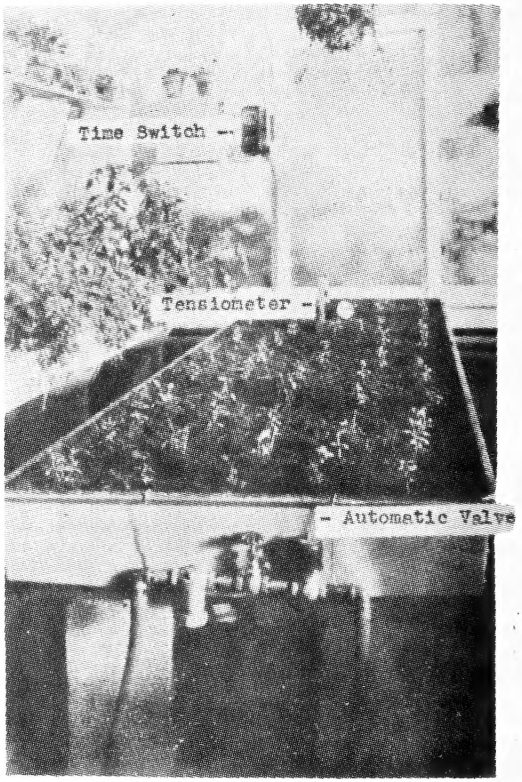
Lord and Burnham at Irvington, New York, or Mike Winandy at Richmond, Indiana, make cement benches with expansion joints. These expansion joints are copper strips bent in the form of a V and cemented in. They should be spaced at least every 20 feet. The copper will soon dissolve in the soil unless it is given several coats of asphalt.

In pasteurizing soil in cement benches, use the surface method suggested by Mr. Thomas (Cornell Bulletin E635) and raise the temperature slowly to allow the cement to expand evenly. Cracking is most severe on rapid heating.

The new Lord and Burnham steel bench looks promising if a coating can be found that will protect the metal for an indefinite time. We have had one in operation for more than one year in our greenhouses.

## FILLING THE BENCHES

The water conductor can be 3-inch drain tile, 4-inch half tile, angle iron, or an angle of wood. Place it in the V and spread pea gravel over the bench bottom to a depth of 1 inch at the outside. Add soil to the top of this to fill the bench.




Time switch - Tensiometer - Automatic valve

Metal bench equipped for automatic watering by the injection method. Lord and Burnham Company.

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## WATERING

After planting, flood the soil from below to completely saturate it. Then drain the water from the bench. If you are running a constant water level, set the valve to hold the water so it is ½ inch in the bottom of the soil in the bench. If you are using the injection system, set the equipment to start operating immediately when the soil dries to one inch of tension. If you are injecting the water manually, follow the tensiometer and inject about 2 quarts of water to the square foot of bench area when the tensiometer reads one inch. Flood and drain the bench once each month to re-establish capillarity and leach fertilizer from the surface if necessary.

## FERTILIZING

In preparing the soil, correct it for lime and add 5 pounds of superphosphate to

each 100 square feet of bench area. If the soil is low in potash add 1/2 pound of muriate of potash per 100 square feet. Lime, phosphate and potash are worked into the soil before planting. This will usually be enough of all three for one year and in many cases for two or three years. Test the soil for nitrate once each month and when it is reduced to 15 to 25 parts per million by the Spurway Quick Test add 1 pound of ammonium sulfate or 1/2 pound of ammonium nitrate to each 100 square feet.

The best method of applying these nitrogen carriers is in liquid form. Fill your power sprayer with water, remove the spray nozzel and water a bench. When the tank is empty measure the area covered. Weigh the amount of material necessary and dissolve it in the tank of water, then cover the area as with the trial tank of water. Your speed of coverage will be about the same as before and the nitrate will go into the soil.

After the fertilizer is applied, flood and drain the bench or surface water to further leach the fertilizer into the soil.

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SOME THINGS WE HAVE LEARNED ABOUT WATERING

1. Plants in 5 or 6 inches of soil grow better if the soil is kept uniformly wet than if it is allowed to dry considerably between waterings. This has been true with roses, carnations, peas, chrysanthemums, snapdragons, and other crops.

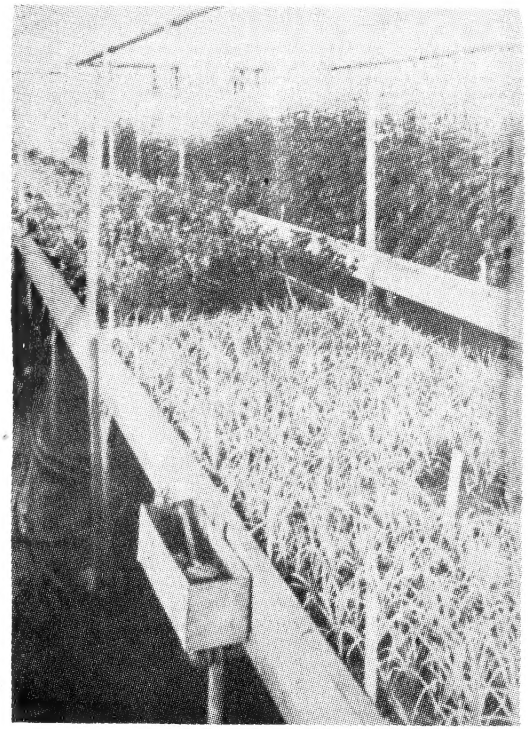
2. It is uneconomical to surface water by hand as frequently as is necessary to keep the soil uniformly moist. You would need to water roses in shallow soil every day and carnations about every second day.

3. Immediately following the planting of roses, rooted cuttings, or potted plants of any kind, you should water the soil thoroughly and not let it dry to more than 1 inch of tension before you water it again. Plants may be injured if you allow them to become dry after the first watering. This is especially true in spring and summer.

4. For potbound plants shifted to larger pots, you should keep the soil wet for the first 7 to 10 days after shifting them. This encourages roots to grow into the new soil.

We find poinsettias are best if watered every day for 10 days after panning. The best results were obtained when panned plants were set in a watertight bench with the base of the pot standing in water for the first week. Leaf loss or dead areas in the leaf may be caused from drying.

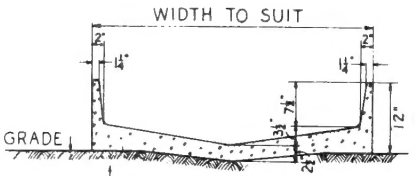
The reasons for keeping plants wet after planting are the following: (1) Roots grow from drier to wetter soils. (2) Plants are injured if they cannot get water. The idea that roots grow better in dry soils than in wet soil is an incorrect interpretation of an age-old fact. In dry soil the tops are stunted but the roots continue to grow. Florist crops are not grown for roots, therefore it is undesirable to stunt the top, especially in the early stages of growth. (3) Plants benched or shifted are able to withdraw water from the area in which the roots exist. They are dependent on capillary movement of water to this area from the new soil. If water loss is rapid, the ball of soil in which the roots exist, dries and shrinks slightly. This allows an air space around the original ball and water no longer moves to the ball by capillarity. Watering frequently at first to keep the soil very moist allows good capillary movement of water to the ball of roots and supplies the ball with water until the roots have grown enough to reach into the new soil. (4) Surface watering destroys the soil structure and produces a puddled condition.



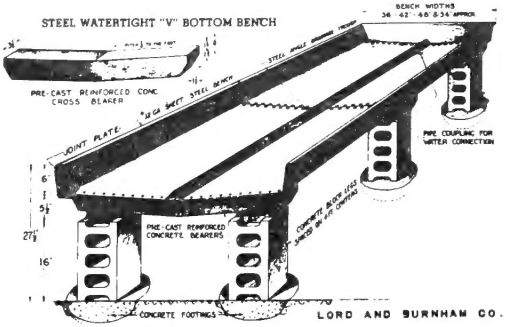
Propagating Bench - Constant water level using poultry watering float valve to maintain water level. Cornell University 1/46

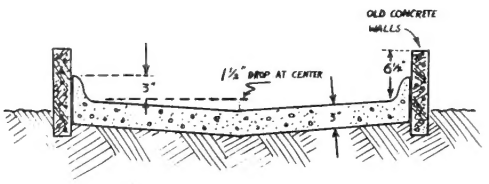
# Benches for Automatic Watering

## V-Bottom Concrete Ground Beds

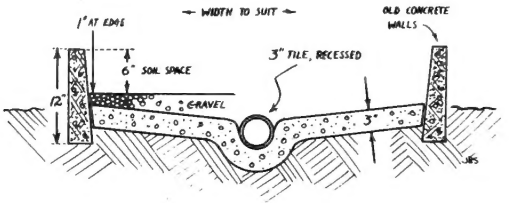



LORD & BURNHAM CO.
CB 44

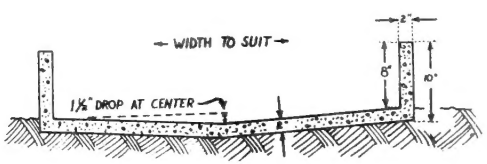


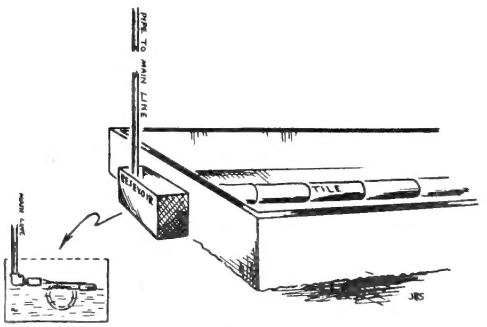

A POSSIBLE METHOD OF PUTTING WATERPROOF CONCRETE IN BEDS WITH SIDE WALLS. USE EXPANSION JOINTS EVERY 10 TO 20 FEET. RUN HOT ASPHALT IN THE CRACK BETWEEN OLD AND NEW CONCRETE. K. POST



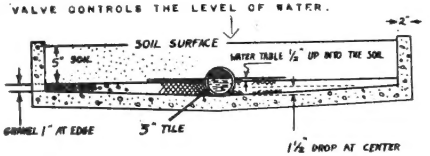

REMODELING BENCHES WITH CONCRETE SIDEWALLS. HOT ASPHALT SHOULD BE POURED IN THE JOINT BETWEEN OLD AND NEW CONCRETE. PLAN BY HERMAN SCHENKEL OF WM. PINCHBECK, INC. OF GUILFORD, CONN.

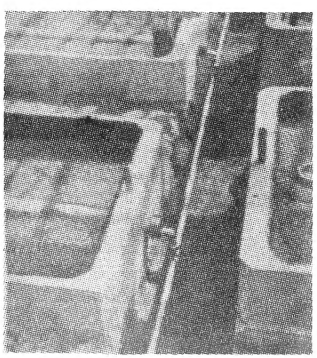




BROOKINS BENCH CONSTRUCTION. HOME-MADE FORMS. --BY HAROLD BROOKINS, ORCHARD PARK, N.Y.

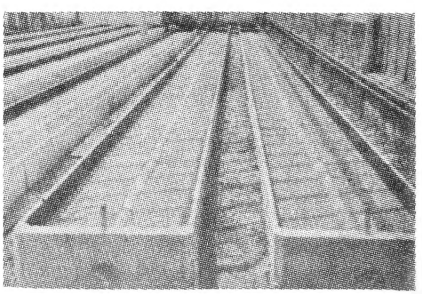



ARRANGEMENT FOR CONSTANT WATER LEVEL. POULTRY WATERING FLOAT VALVE CONTROLS THE LEVEL OF WATER.



SEVERAL BENCHES ARE CONNECTED AND WATERED FROM ONE AUTOMATIC VALVE OR A FLOAT VALVE AT GEORGE HARTS FAIRPORT



CEMENT BENCHES OF THE WINANDY CONSTRUCTION FOR AUTOMATIC WATERING AT GEORGE HARTS, FAIRPORT

# What Growers Say About Automatic Watering

THE FOLLOWING LETTERS WERE RECEIVED BY THE AUTHOR DURING THE MONTH OF FEBRUARY, 1946. REPORTS FROM GROWERS SHOW MORE THAN 200,000 SQUARE FEET OF BENCH AREA IS NOW IN AUTOMATIC WATERING IN THE NORTHEASTERN STATES.


I have just completed our report for December and January, and I wanted you to know some of the facts in the report. We are 28,000 roses ahead of last year for December and 40,000 ahead of last year for January. These two months together are 12,000 roses more than our best previous record for these two months.

I only wish I could have had this report so that I could have given some of the results at the Short Course. There has been so much that has been of interest in it. We graded these roses for January separately and compared them with those of the same variety surface watered. Those automatically watered ranged from 3 - 5 1/2 per cent nine inch, while those from the houses that were surface watered, ranged from 10 - 13 per cent nine inch. For January the total cut for all varieties was 13 per cent nine inch. This was the best in nine years, when we had 12.6 per cent nine inch but when we did not have the production along with it.

In comparing two, hundred foot benches, one automatically watered and one surface watered, each with tensiometer and watered at the same reading, we found that the automatically watered bench used 120 gallons of water each watering while the one surface watered used 600 gallons. In seven months we used 3,130 gallons against 30,000 gallons. This is about a 90 per cent saving on water alone.

Mike Winandy has promised to be here in a month to put in 8 two hundred and fifty foot benches and thirty, one hundred foot benches, all these will be the Post's type for automatic watering. Of the new benches finished last month, we have 7 one hundred foot benches hooked up to be watered by one automatic valve. The other 7 one hundred foot benches are arranged to maintain a constant water level with one float valve.

Gardenias

We have a house of gardenias in raised shallow V bottom concrete benches. Some of these have been surface watered, some we maintained constant water level and some have been watered by the injection method. Using a hundred as a basis of production from the surface watered benches, we have 119 from the automatically injected and 127 from the constant water level benches.

Best of all though is the increase in larger grades from the benches of the new type watering. Taking the month of January and comparing it with January 1940 which was our best previous January we have the following:

| | Surface watered Jan.'40 | Automatically Watered Jan.'46 | 1st 15 days Feb.'46 |
|---|---|---|---|
| Specials | 10% | 14% | 25% |
| #1 (average 4") | 39% | 79% | 59% |
| #2 | 28% | 6% | 16% |
| #3 | 22% | 5% | 0% |
| #4 | 1% | 5% | 0% |

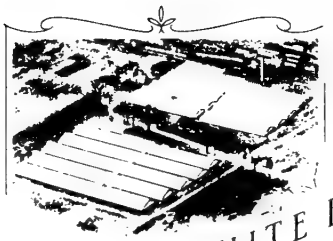
Our monthly soil tests show there is a big saving on the amount of fertilizer used in automatic watering. The plants put in your type of bench last June have not as yet required any fertilizer. While those planted in old style benches have required monthly applications of fertilizer starting the second month after planting.

It is a lot easier to maintain the nitrate level in the automatic benches as it does not leach out. And with the better nitrate level we are getting better stem length.

We are completely sold on automatic watering, for it's labor saving, watering is more accurate and we are saving on water (90 per cent saving). The soil structure is relatively unchanged. It prevents packing down and poorer growth as a result. With the labor of today there is always the chance of spreading disease with surface watering and automatic watering has eliminated that chance.

So we feel that the above results warrant a change over as soon as possible. By this summer we will have fifteen 250 Ft. benches, fifty eight 100 Ft. benches and two 50 Ft. benches (for propagating), all automatic. And the rest, we hope next year can be changed over.

C C Butler



WHITE BROS.
ROSE CORPORATION
SINCE 1897 MEDINA · NEW YORK
TELEPHONE 20

Here is a report on our automatic watering of roses at Medina.

Eight 200 ft., V-bottom concrete ground beds were planted to Lucile Supreme in May 1945.

One bench has a constant water level maintained with a float arrangement, the level of the water being practically at the bottom of the soil. Another bench has one and one-half quarts of water per square foot of bench area metered to it manually when the tensiometer shows one inch of vacuum. The balance of the benches are watered conventionally.

The only overhead watering that has been done to the two benches that are automatically watered is when applying fertilizer.

To date there is no significant difference in production between any of the eight benches.

Because the balance of our existing benches are of the raised concrete type, we are not going to build any more ground beds at the present time. However, we are experimenting with the conversion of the raised concrete bench to make it adaptable for automatic watering and we intend to convert two of them this year. If the production on our automatically watered benches continues at its present rate, we will undoubtedly construct more benches of this type in the future.

Clifford Burke

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## WILLIAM PINCHBECK, INC.

*Roses and Gardenias*

GUILFORD, CONNECTICUT

We have here at Wm. Pinchbeck Inc., six three hundred foot V-bottom beds, standard L. & B. construction, which will be put into automatic watering immediately. We are awaiting the construction of six more beds, which will be on automatic watering from the beginning, and we plan to convert our existing ground beds as we plant them, according to the sketch I have for automatic watering.

From my experience with automatic watering at Elliott Rose Co., there is no question as to its being practical; it is a question of how fast conversion can be accomplished.

Herman P. Schenkel

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## H. H. REEVE & SONS

*FLORISTS*

MATTITUCK, N. Y.

You may be interested in what we think will be the cost of our benches:

| | |
|---|---|
| Welded reinforcing wire | $250. |
| Expansion joint coppers | 325. (placed 12 |
| " " fibre | 75. to a bed) |
| 700 bags of hi-early cement | 660. mix 1-2-3 |
| 100 yards of gravel | 300. )this may |
| 5 yards of sand | 25. )be low |
| labor in our own gang figuring 4 men 1 week for 2 beds | 1350. |
| | $2925. |

We think that for us about $2000 is what it will actually cost us extra because most of our labor we would have to have on the place anyway. This will build 18 - 120 ft. benches.

We are planting our carnation cuttings in the benches as we build them and although we haven't them piped up for automatic watering we are very much pleased with the way they act after injecting water in the bottom. It was certainly a surprise to us how we could wet a powder dry bed and also how long one watering of 20 minutes lasts.

Elwood S. Reeve

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Florists Nurserymen Landscape Contractors

## JERRY BROOKINS, INC.

GREENHOUSES FLOWER SHOP

ORCHARD PARK

NEW YORK

The beds we are building for automatic watering are of concrete and rest directly on the ground. We first grade the bed location level from end to end and sloped 1 1/2 inches from side to center. Then we set 8" planks for the inside and 10" planks for the outside forms. It takes two men 8 hours to set the forms for a bed and remove them after the concrete has set.

A bed 4 feet wide and 72 feet long takes

2 1/2 yards of concrete. We buy it ready mixed and when it arrives a 10-man gang places it in about an hour. The side walls and bottoms are 2 inches thick. We strengthen the corners with 3/8 inch reinforcing bars.

On a commercial place like ours the uncontrolled variable factors make it very difficult to conduct accurate research such as is done at Cornell. We do, however, like to find evidence of the benefits from the application of the results of Cornell's research in our own establishments. We had an opportunity to observe the influence of automatic watering on some rose plantings.

In the Spring of 1942, we planted 4 beds of Peter's Briarcliff. Beds A and B were shallow V Bottom, Beds C and D were our regular ground beds. We used the sub-irrigation method on A and B but without tensiometers and without the automatic feature, simply giving them water when we thought they needed it. Beds C and D were surface watered in our usual manner. The production from these 4 beds were not significantly different from each other nor from other plantings of the same sort. In July 1945, we received our first tensiometers and automatic equipment and set up beds A and B to so operate. The succeeding 5 months production showed a remarkable increase for the automatically watered beds. Here are the figures:

| Automatic | | Surface | |
|---|---|---|---|
| Bed A | Bed B | Bed C | Bed D |
| 4822 | 4769 | 3927 | 3724 |

In addition to this numerical increase, the length of stems was very noticably in favor of the Beds A and B.

We have here at the present time, 51 beds in automatic watering. They vary in size from 65 feet to 125 feet in length. Thirty-one of these beds are in roses, the balance in Sweet Peas, Snapdragons and Stocks. Our program calls for building additional beds for this method as fast as crop , rotation and manpower will permit.

Harold B Brookins

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## N. H. WRIGHT, INC.

WHOLESALE GROWERS OF CUT ROSES

GREENS · FLORISTS' SUPPLIES

CRANBURY, NEW JERSEY

We use the standard Lord & Burnham - Mike Winandy beds, with 3" V. We buy our concrete ready mixed, do the work ourselves except for one outside concrete finisher, and figure the beds cost us a little under $1.50 per linear foot, including rental of forms.

We place the end elbows and nipples on the beds so that when the elbow is looking up it is at the same level as the top of the gravel inside the bed. When water is run into the bed until the elbows overflow, the level of the water just touches the bottom of the soil. We find that this keeps the soil at a very constant moisture. In clear weather we fill the beds every second or third day. In cloudy weather, when the water level goes down in the bed, we let it stay down until clear weather returns.

Our production figures on our V-bottom beds are not comparable with any other beds in the place, on account of differences in age and variety. But the foliage on these beds has definitely been of better color this winter than our ground beds - no chlorosis while ground beds had chlorosis. Several visiting growers have remarked on the vigor of growth in these beds.

A few days ago we took out two beds of plants that had been put in V beds last year. The plants were old and had been transplanted without chilling. Growth had been excellent. The most interesting feature was the very great amount of fine roots these plants had - more than on any other plants we ever dug.

We washed out the gravel thoroughly then found it advisable to add some grits on top. There was almost no deposit on the bottom of the beds nor in the drain. There was no sourness - even the bottom of the beds smelled sweet and fresh. From the above you will gather that we took out the old soil and put in new - did not sterilize.

We put in 1800 linear ft. of these beds last season and we are now putting in 2700 ft. this year.

Norman Wright

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## BURTON O. SMITH

SWEET BIRCH FARM

KENNETT SQUARE, PENNA.

Steel Benches

10' - 0" long by 33" wide, inside for rooting cuttings by the automatic, constant water level method. Built in units of 10' so that one bench may be filled at a time and after draining down to irrigating level will not have to be disturbed when sticking later cuttings.

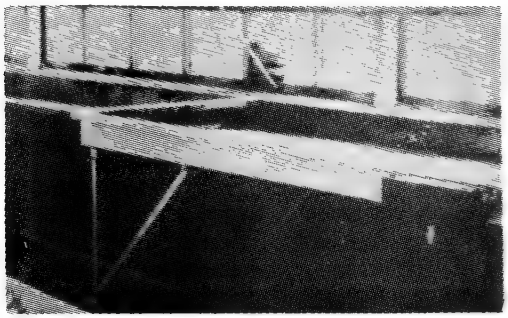
Automatic watering has been used only in ground beds with sub soil bottom. Clay sub soil covered with 10" clay loam top soil. Two rows of 4" hexagonal tile in 48" bed.

It was first used to supplement top watering in hot weather 10 years ago. Used for growing peas without any top watering for nine years. We have never used top watering to drive the nutrients back down during the crop.

It was used on all crops without top watering except at bedding time (two heavy waterings followed by light cultivation) for four years. Snaps, Poms, Peas, Iris, Stocks, and Tomatoes were grown. Only Tomatoes were top watered at feeding.

We find the following advantages:

Labor saving-one less man needed (50,000' plant)
Watering can be done any time of day.
Much better growth and quality.
No foliage diseases, therefore fine, clean foliage on finished product. This gets top prices. Better soil condition because of no packing which is serious in our heavy soil. Easy removal of old crop and reworking. Gets rid of the dreariest and hardest-to-teach job in the greenhouse.



Burt Smith's steel bench for propagation with the tank and float valve on the side. Bench designed and made by Mr. Smith.

Burt

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1. Variety—Peter's Briarcliff
2. Number—5000 plants
3. Construction of bed—Beds approximately 200 feet in length divided into two sections of approximately 100 feet. We employed a local contractor who cemented the bottom of ground beds to an average depth of three inches with a pitch to the center of the bed of about one inch. In the center, a depression was made in grade and cement poured around a wooden form of just sufficient width to hold sections of three inch land tile. After cementing, and removal of form, land tile was laid in each bed, and the entire bottom area of the bed was covered with pea gravel. The beds were filled with sterilized soil and the plants planted. These 100 feet sections of the beds had a pitch of two inches. At the low end a two-inch water main was run overhead with three-quarter inch drop pipes to each bed. A main two-inch control valve and three-quarter inch valve for each bed were installed. A one-inch galvanized pipe was run thru the bed end with a threaded end projecting, so that a cap could be installed when watering.

In watering, the two-inch valve is turned on and the three-quarter drop pipes that enter each bed thru the three-inch land tile are filled with water. This is allowed to stand for about two hours and then the one-inch caps are removed at the end of the bed. Our experiment indicates that is is desirable to make every fifth watering a surface watering.

Frequency of watering was for six to ten times per month.
Tensiometers were used.
These beds were planted last April.

In my judgment, not having a comparable area planted at the same time with the same grade of plants to make a comparison, would estimate that an increase of production up to the first of March this year, would be about three roses per plant. In addition to this, our experience has been that we get much greater stretch, consequently longer grade of rose.

This year we are installing additional automatic beds, and we expect to have about 33,000 plants growing in beds so equipped.

In closing, would say we are enthusiastic about the future of automatic watering, and we are surprised how much water roses will really take when watered by this method.

JOHN S. ELLIOTT, PRESIDENT

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Here is the report on the V-Bottom benches, that we have in one of our rose houses, which is used for automatic watering tests. This greenhouse is 250' x 50', containing sixteen V-Bottom benches. During the past year, we tried out one bench with an electric tensiometer and automatic valve. This system seems to keep the plants much wetter, and we have a more vigorous growth than in the others that are watered by hand. In the balance of this house, we try to maintain a constant level. By this, I mean that the water is always to the top of the gravel. This lot is very good. We are now installing some of the benches with chicken float valves. These will be connected to the water on the ends of the bench, and should be installed within the next few days.

In the carnation house, we have one third of the house in V-Bottom benches, and we are injecting all the water through the tile pipe. We notice that in keeping the foliage dry, the rust and stem rot are entirely eliminated. These benches look very good to me, and I believe that when the first expense is over in building these, it will exclude all future repairs, and it should be a life-time investment. We find that we can grow much better and stronger plants, thereby, increasing production enormously. The saving alone on labor is also worthwhile looking into, as it takes one man less than ten minutes to water a house of V-Bottom benches with automatic watering.

This system has, indeed, proved to be very satisfactory and profitable.

C.F.BERTANZEL

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## FAUST & FENN

## *Growers*

WANTAGH, L. I., N. Y.

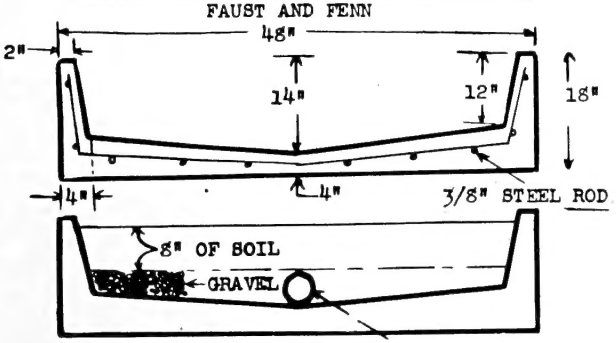
Our benches are constructed as the enclosed drawing shows, they are deeper because we use 4" round tile perforated on the bottom half. The benches are reinforced with 3/8" steel rods every 12" across and lengthwise with an expansion joint every 8 feet.

Our record of production is the same as our surface watering benches but we find longer stems on our constant water level benches. Following is our production record:

Carnation Cut

From 15,400 plants we have cut up to February 21, 1946, 62,572 flowers. These plants are planted in ten benches 4,000 square feet. We started cutting September 16, 1945. Total average is 15.5 flowers per square foot.

CONSTANT LEVEL BENCHES AS CONSTRUCTED BY FAUST AND FENN




4" Tile perforated on bottom half only.

An expansion joint is used every 8 feet. We do make a bench longer than 12 sections which is 96'-6' long, these benches can be safely sterilized with steam.

Raymond H. Faust

## E. H. KIPP, INC.

GROWERS OF CUT ROSES

MILLWOOD NEW YORK

In the spring of 1943 we constructed one V-Bottom concrete bench 110 feet long. This bench was planted with rose plants and has been watered by sub-irrigation. Since then we have constructed 4316 feet of this type bench, using forms supplied by Lord & Burnham Co., Irvington, N.Y., and method of construction as advised by them. All these beds are water tight and can be watered by the sub-irrigation method.

Our system of watering these beds in the past two years is as follows: During the spring, summer and early fall we water almost entirely by flooding the bench or by sub-irrigation. However, we have found that in the winter there were certain times when it was advisable to surface water these beds and particularly during long stretches of dark weather. During these times we water the beds by surface watering. All fertilizer has been applied to the surface of the benches and immediately watered in by flooding the surface of the bed.

It is simple and easy to water these benches. All we do is cap the ends of the drain pipe in the bulkhead, and then open a one-inch water line which is inserted into the drain tile approximately in the center of the bench. When the water reaches the top of the soil in the bench, we shut off the flow and open up the drains. As we have our own water supply we do not save the drainage water.

We are experimenting with one of these beds and with this bed we are constantly maintaining water in the bottom of the bench up to the top of the tile or gravel layer. This method of watering has not been in operation long enough to determine results - but at present no damage has resulted from this treatment, the growth being as good as a sub-irrigation bench along side of it.

The growth of the rose plants in all of these V-Bottom benches so far has been strong, free and exceptionally even throughout the entire greenhouse.

We have found this type of bench and method of watering entirely satisfactory for growing roses and we will this coming spring construct an additional 1800 feet of these benches.

We would be glad to have anyone who is considering installing this type of bench stop in at our plant and examine our benches.

COST OF CONSTRUCTION 3346 FEET OF V-BOTTOM CONCRETE BEDS - CONSTRUCTED SPRING AND SUMMER 1945.

| | |
|---|---|
| Contractor @ $1.50 per ft. of bench, material and labor | $5,019.00 |
| Gravel 3/4" at $2.75 per yd. | 275.00 |
| 3" Round field tile at 8¢ per ft. | 267.68 |
| Copper expansion joints 20' apart at $1.00 each | 168.00 |
| Rental on forms at 20¢ per ft. | 669.20 |
| Trucking charges on forms | 40.00 |
| Bulkhead drain pipes and frame pipes | 90.00 |
| | $6,528.88 |

Cost per foot $1.95

Above costs do not include cost of replacing heating coils, installing watering system, wiring frames or labor placing drain tile and gravel in beds.

E. A. Hipp

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## JOHN R. THOMAS

WHITFORD, PA.

### AUTOMATIC WATERING OF GROUND BEDS

In developing a new technique we often advance as much through errors, learning what to avoid, as we do through our successes, so I will therefore devote more time to the mistakes we have made than I will to the advantages of automatic watering with which we are all more or less familiar.

Some five years ago we built two 120 ft. by 42 inch by 9 inches deep, ground beds made from concrete with a V-Bottom having a three-inch drop. This was our first mistake. The middle of the bed became saturated before the sides which caused the edges of the beds to run too dry. I know a shallower V would be better, and I believe a flat bottom with a water channel cast lengthways in the concrete would be better still. We made one bed level from end to end, but the other we made with a slope of 2 inches in 120 feet. This was our second mistake. The low end of the bed was always wetter than the high end. This because water would lie in the lower portion longer than in the upper part also there was 2 inches more soil in the lower end acting as a reservoir for reserve moisture.

Our first installation was made with three-inch tile laid along the middle of the bed with a covering of 1/2 inch crushed stone laid level and deep enough to cover the tile and the bed then filled with soil. I am inclined to believe this was a mistake. In our experience the fine particles of soil filtered down into the crushed stone and before long had completely filled the spaces between the stones. We are sure that the water had more difficulty in penetrating this aggregate laterally than through soil alone.

Our next mistake was in being in too much of a hurry when automatically watering these beds. The water was introduced through a stand-pipe at one end of the 120 foot bed through a 3/4" hose at 50 lbs. pressure. A little common sense would have told us that this pressure in the tiles would break out first where the soil was loose and the consequence was very uneven moisture throughout the bed. We have found since that a very small stream of water entering the tile does a much better job as it allows the soil to absorb the water rather than trying to force water into the soil. We now take 4 to 5 hours to water a bed which we first tried to do in 30 minutes.

So much for our mistakes. I will now describe the measures we have taken to correct them. We first removed the top soil and discarded the mixture of stone and soil in the bottoms of the beds, we also discarded the tile. Across the V in the middle of the beds we laid sheets of linabestos or transite one foot wide and raised above the concrete by 1/4" blocks of the same material so the sheets would not hug the concrete bottom too closely. We then filled the beds with soil. Half way along the bed with the 2" slope we built a dam 2" high in the bottom of the bed leaving a spill-way so that the water would flow into the lower half of the bed only after it had raised 2" in the upper half. NOTE, we still have to drain the lower half after each watering.

We next installed a tank with a float valve in the end of each bed, similar to a toilet tank, with the float adjusted to hold the water level 6" below the surface of the soil. Water is piped to the tanks so to water a bed all that we do is turn on a valve and go about some other job. We leave the water turned on until the tensiometers begin to drop which takes from 4 to 5 hours. In another 8 to 10 hours the tensiometers have dropped to about 1 inch of vacuum which is the lowest point they reach. The high point, when we feel the beds should be watered, varies with the crop. We water at 5 inches of tension for Snaps and about 3 inches for Pompons and Tomatoes. We are old fashioned enough to believe that a fluctuation in the moisture content of the soil is beneficial to root growth.

We find that with repeated automatic watering the soluble salts concentrate in the upper 3" of soil, so once a month we give the beds a good surface watering. This often coincides with our feeding program. We find that the Nitrates are almost completely lost in the lower soil, Potash not quite so much while the Phosphates stay in place.

Conclusions:- Beds must be level from end to end. Beds should have a very shallow V or a flat bottom. If the bottom is flat a channel should be cast in the concrete so that excess water can drain away from the soil.

We have never tried a layer of sand in the bottom of the bed to conduct water laterally but believe it would be better than gravel or crushed stone. We are now getting

Con't on pg. 16

# Revised Recommendations for Azobenzene

Dr. W. E. Blauvelt
Department of Entomology, Cornell
March 5, 1946

The best method of fumigating with azobenzene in houses having steam is the use of 70% azobenzene powder, made into a paste with water and painted on the steam pipes. The 70% azobenzene powder is available from the following companies and through most dealers in florists' supplies, under the following trade names.

Azofume 70-Plant Products Co.,Blue Point, N.Y.
ABZ Fumigant-Atlas Powder Co., Wilmington, Del.
Hypozene-Hydroponic Chemical Co., New York 18, N.Y.
Mite-Y-Fume-Andrew Wilson Inc., Springfield, N.J.

Hot water pipes are not satisfactory for vaporizing azobenzene powder. In houses without steam, fumigation can be done with lamps or hot plates as described later. Azobenzene pressure fumigators and other devices not requiring lamps are being developed and look very promising.

DIRECTIONS FOR USE OF 70% AZOBENZENE POWDER

1. Calculate carefully the cubic capacity and amount of fumigant required for each house, and record this for future use. A satisfactory dosage of 70% azobenzene powder for most houses is 1 pound per 40,000 cubic feet of space.

To calculate the cubic capacity multiply the length of the house by width by the average height, in feet. (To get the average height, measure the height from floor to ridge and floor to eave, add and divide by 2). For example: A house 250 feet by 50 feet has 250 x 50=12,500 square feet area. If the height at the ridge is 20 feet, and the height at the eaves 7 feet, then 20 plus 7 = 27, and 27 divided by 2 = 13 1/2 feet average height. Then 12,500 x 13 1/2 = 168,750 cubic feet.

To calculate the number of pounds of 70% azobenzene powder required, divide the number of thousand cubic feet (the nearest whole number) by 40. For example: If a house is 168,750 cubic feet, then 169 divided by 40 = 4.2 pounds, or 4 pounds, 3 ounces.

2. IMPORTANT - Pick a time to fumigate when you can maintain the proper temperature. The best temperature is around 75 degrees F., with a range of 70 to 85 degrees. Lower temperatures are more dangerous than higher ones. A drop in temperature below 70 degrees during fumigation is very likely to cause injury, while temperatures have often gone to 90 or even 95 degrees without causing any important injury. Fumigation may be done either in the daytime or at night depending on the outside temperature. In cold weather it is best to fumigate in the daytime on a cloudy day, with moderate temperature, and little or no wind, starting at 9 to 10 A.M.

3. Weigh out the required amount of the fumigant into one or more pails. Add water either by measure or a little at a time, and stir to a smooth thin paste the consistency of paint. One to one and one-half pints of water per pound of powder is about right.

4. By means of a 3- or 4-inch paint brush (a No. 1 oval varnish brush is excellent), apply a thin coat of the paste to the upper surface of four cold steam pipes the length of the house. Treat two pipes near the sides and two near the middle of the house. In extra wide houses treat one pipe per ten feet of width. To insure even distribution, treat 4 or 5 feet of pipe, skip 2 feet, and repeat, then go back and apply any material left to the blank spaces.

5. Close the vents and get the temperature up to 75 degrees before starting the fumigation. This can be done while applying the material. Then turn on one pair of vaporizing pipes, or half of those treated. The heat melts the azobenzene, which then fumes off as a visible orange colored vapor. An hour and a half later turn on the rest of the treated pipes. The first set may then be turned off or left on, depending on the temperature.

6. Keep the vents closed for six hours from the time you turned on the first vaporizing pipes. Keep the temperature around 75 degrees or above for the entire fumigation period. Then ventilate.

7. Ventilate for at least 3 hours with plenty of steam on and vents adjusted to drop the temperature slowly (3 or 4 degrees an hour). This is important.

DIRECTIONS FOR USE OF AZOBENZENE CRYSTALS WITH LAMPS OR HOT PLATES

For vaporizing with lamps or hot plates azobenzene crystals should be available from the same companies handling the powder form.

The dosage for azobenzene crystals is 1 pound to 57,000 cubic feet, or 1 ounce by weight to about 3,500 cubic feet. By using one lamp or hot plate for each 7,000 cubic feet, the total dosage will be 2 ounces by weight for each lamp. A 1 1/2 fluid ounce jigger holds approximately 1 ounce by weight of azobenzene crystals when level full. Thus 2 level jiggerfuls is the total amount for each lamp at this spacing. The crystals should be vaporized over a period of 2 to 3 hours. To be safe, it is best to put in one-half the amount (1 level jiggerful) at the start, and the rest at the end of an hour to an hour and a half. Adjust the heat so that

each half-dose will vaporize in about an hour's time. Experiment with one or two lamps or hot plates to find the proper adjustment before fumigating a house.

PRECAUTIONS IN FUMIGATING WITH AZOBENZENE

Since there is little experimental information on possible ill-effects of azobenzene vapor to man or animals, it is well to observe reasonable precautions.

We recommend wearing a felt-pad respirator when in the houses during the fumigation, and avoiding unnecessary long exposure. A good felt-pad respirator is the Dustfoe respirator, sold by the Mine Safety Appliance Co., Braddock, Thomas and Mead St., Pittsburg, Pa., and by Sears Roebuck & Company.

AZOBENZENE FOR PLANTS OTHER THAN ROSES

Although developed and recommended especially for roses, experiments indicate that azobenzene fumigation is safe and effective for control of red spider mite on carnations and many other florist crops. A considerable number of large-scale tests have been made on carnations in various commercial ranges, with no injury other than a slight bleaching of open buds of some pink and red varieties. A number of trials in small to moderate sized houses indicate that azobenzene fumigation is also safe on chrysanthemums, gardenias, camellias, hydrangeas, geraniums, ivies, cyclamen, kalanchoe, ageratum, cinerarias, primulas, coleus, and a number of other crops, but we want to have more and larger scale tests on some of these before making unqualified recommendations. Azobenzene fumigation is not recommended for sweet peas, as these usually develop rather serious leaf burn.

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con't from pg. 14

a very fair distribution of moisture from side to side with just soil in the beds.

On long beds (over 100 feet) we believe the water should be introduced in the middle of the bed rather than the end.

We feel our present 9" deep beds are a little too deep and believe 6" or 7" of soil would be enough.

The above represents our present view of automatic watering of ground beds, but are subject to change as we gain experience. Many of our ideas come from Cornell and others we arrive at by trial and error (mostly error) so that in another year we will have more concrete information to offer.

John Thomas

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Your editor.

Kenneth Post

DR. BLAUVELT EXPLAINS AZOBENZENE FUMIGATION TO INTERESTED FLORISTS